

# MATERIAL SAFETY DATA SHEET

**SRM Supplier:** National Institute of Standards and Technology  
**Standard Reference Materials Program**  
**Bldg. 202 Rm. 211**  
**Gaithersburg, Maryland 20899**

**SRM Number:** 3141a  
**MSDS Number:** 3141a  
**SRM Name:** Potassium Standard Solution  
**Date of Issue:** January 1988  
**Date of Revision:** March 1, 1999

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## SECTION I. MATERIAL IDENTIFICATION

**Material Name:** Potassium Standard Solution

**Description:** SRM 3141a is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of potassium with a nitric acid volume fraction of 10 %.

**Other Designations:** Potassium (kalium; potash) in Nitric Acid (aqua fortis; hydrogen nitrate; azotic acid; engravers acid; nitryl hydroxide); Potassium Nitrate\* (potassium salt; saltpeter; niter) in Spectrometric Standard Solution

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Potassium Nitrate	KNO <sub>3</sub>	7757-79-1
Potassium	K	7440-09-7

**DOT Classification:** Nitric Acid Solution, UN2031

**Manufacturer/Supplier:** Available from a number of suppliers.

\*The addition of potassium to nitric acid, along with other intermediate chemical reactions, forms potassium nitrate which will precipitate upon evaporation or drying of the solution.

## SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>50</sub> : 430 mg/kg
Potassium Nitrate	2.6	No TLV-TWA established.*
		Rat, Oral: LD <sub>50</sub> : 3750 mg/kg
		Rabbit, Oral: LD <sub>50</sub> : 1901 mg/kg
Potassium	1	No TLV-TWA established.*
		Mouse, Intraperitoneal: LD <sub>50</sub> : 700 mg/kg

\*The suggested ACGIH TLV-TWA for particulates not otherwise regulated is 10 mg/m<sup>3</sup> for total dust.

### SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Potassium Nitrate	Potassium
<b>Appearance and Odor:</b> A white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light; an irritating odor.	<b>Appearance and Odor:</b> Colorless, transparent prisms or a white granular powder.	<b>Appearance and Odor:</b> A soft, silvery-white metal; body-centered cubic structure; tarnishes on exposure to air and becomes brittle at low temperatures; odorless
<b>Relative Molecular Mass:</b> 63.02	<b>Relative Molecular Mass:</b> 101.11	<b>Relative Atomic Mass:</b> 39.098
<b>Density:</b> 1.0543 (10 % nitric acid)	<b>Density:</b> 2.11	<b>Density:</b> 0.86
<b>Solubility in Water:</b> Soluble	<b>Solubility in Water:</b> Soluble	<b>Solubility in Water:</b> Reacts with water.
<b>Solvent Solubility:</b> Decomposes in alcohol	<b>Solvent Solubility:</b> Soluble in liquid ammonia and glycerol; insoluble in dilute alcohols, absolute ethanol, and ether.	<b>Solvent Solubility:</b> Soluble in liquid ammonia, ethylene diamine, and aniline.

**Note:** The physical and chemical data provided are for the pure components. Physical and chemical data for this potassium/nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

## SECTION IV. FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** N/A

**Method Used:** N/A

**Autoignition Temperature:** N/A

**Flammability Limits in Air (Volume %):**      **UPPER:**      N/A

**LOWER:** N/A

**Unusual Fire and Explosion Hazards:** Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires. Potassium nitrate is not combustible; however, it is a strong oxidizer that can ignite and intensify the combustion of flammable materials. Potassium is a dangerous fire and explosion hazard when exposed to heat or flames.

**Extinguishing Media:** Do not use dry chemicals, carbon dioxide, or halogenated extinguishing agents because of potassium nitrate. Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

**Special Fire Procedures:** Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

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**SECTION V. REACTIVITY DATA**

**Stability:**            X   Stable                  \_\_\_\_\_ Unstable

**Conditions to Avoid:** Avoid contact with combustible and other incompatible materials. Keep out of water supplies and sewers.

**Incompatibility (Materials to Avoid):** Keep nitric acid away from organic materials, plastics, rubber and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Potassium nitrate is incompatible with acids, reducing agents, metals, combustible materials, metal salts, and halogens. Potassium is incompatible with combustible materials, acids, metal salts, halocarbons, halogens, reducing agents, peroxides, metals, metal oxides, oxidizing materials, and bases.

See Section IV: *Unusual Fire and Explosion Hazards*.

**Hazardous Decomposition or Byproducts:** Hazardous decomposition of nitric acid and/or potassium nitrate can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), as well as nitric acid mist or vapor. Thermal decomposition of potassium may release toxic and/or hazardous gases.

**Hazardous Polymerization:** \_\_\_\_\_ Will Occur   X   Will Not Occur

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## SECTION VI. HEALTH HAZARD DATA

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**Route of Entry:**   X   Inhalation   X   Skin   X   Ingestion

**Health Hazards (Acute and Chronic): Nitric Acid:** Nitric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

**Potassium Nitrate:** Potassium nitrate may be harmful by inhalation, ingestion, or skin absorption. This material is irritating to the mucous membranes, upper respiratory tract, eyes, and skin. Inhalation may cause coughing and difficulty breathing. Ingestion of large doses may result in nausea, vomiting, diarrhea, or convulsions. Absorption into the body leads to the formation of methemoglobin, which results in symptoms related to oxygen deficiency, e.g., cyanosis, headache, dizziness, difficulty breathing, etc.

**Potassium:** Potassium is harmful if inhaled or swallowed. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin. Repeated or prolonged exposure may cause inflammatory and ulcerative changes in the mouth and possibly bronchial and gastrointestinal disturbances. Even when there is no evidence of oral burns, the esophagus and stomach may be involved with burning pain, vomiting, and diarrhea. In persons with kidney disorders, sufficient amounts may be absorbed and cause hyperkalemia (an abnormally high concentration of potassium ions in the blood), resulting in cardiotoxicity.

**Medical Conditions Generally Aggravated by Exposure:** Eye disorders, skin disorders, respiratory disorders, and allergies. Persons with kidney disorders may be at risk from exposure to potassium.

**Listed as a Carcinogen/Potential Carcinogen:**

	Yes	No
In the National Toxicology Program (NTP) Report on Carcinogens	_____	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	_____	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	_____	<u>  X  </u>

**Emergency and First Aid Procedures:**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Obtain medical assistance.

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Obtain medical assistance immediately.

**Note to Physician (Nitric Acid):** Wash affected skin areas with 5 % solution of sodium bicarbonate (NaHCO<sub>3</sub>). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

**TARGET ORGAN(S) OF ATTACK:** **Nitric Acid:** Skin, teeth, eyes, and upper respiratory tract  
**Potassium and Potassium Nitrate:** Skin, eyes, upper respiratory tract, and digestive tract.

## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

**Steps to be Taken in Case Material is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation or destruction.

**Waste Disposal:** Follow all federal, state and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for non-routine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

**Note:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them. **DO NOT** wear contact lenses in the laboratory.

Store this material in its original bottle at room temperature.

## SECTION VIII. SOURCE DATA/OTHER COMMENTS

**Sources:** MDL Information Systems, Inc., MSDS *Potassium*, December 8, 1998.  
MDL Information Systems, Inc., MSDS *Potassium Nitrate*, September 10, 1998.  
MDL Information Systems, Inc., MSDS *Nitric Acid*, December 8, 1998.  
The Merck Index, 11<sup>th</sup> ed., 1989.  
The Sigma Aldrich Library of Chemical Data, Ed. II, 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.